

Page 2 of 10

Patent Application  
Serial No. 10/057,184

**IN THE CLAIMS:**

1                    1.     (Currently Amended)     A thermal barrier coating  
2 comprising a layer of rare-earth element phosphate said layer having a  
3 thickness greater than about 20 micrometers, a thermal conductivity less  
4 than about 2 W/mK and disposed on an exterior surface of ~~a substrate~~ one  
5 of a ceramic substrate and a metallic substrate selected from the group  
6 consisting of a nickel-based superalloy, an iron-based superalloy and a  
7 cobalt-based superalloy so as to thermally protect the substrate, and further  
8 comprising a layer of aluminum phosphate disposed between the layer of  
9 rare-earth element phosphate and the metallic substrate.

1                    2.     (Original Claim)     The thermal barrier coating according  
2 to Claim 1 further comprising a monazite or xenotime crystal structure.

1                    3.     (Original Claim)     The thermal barrier coating according  
2 to Claim 1, wherein the ratio between rare-earth element and phosphate is  
3 about 1:1.

1                    4.     (Previously Presented)     The thermal barrier coating  
2 according to Claim 1, wherein the layer has a thickness between about 20  
3 and 500 micrometers.

1                    5.     (Original Claim)     The thermal barrier coating according  
2 to Claim 1 deposited on a substrate having a temperature between 600°C  
3 and 1100°C.

Page 3 of 10

Patent Application  
Serial No. 10/057,184

1                   6.     (Original Claim)   The thermal barrier coating according  
2     to Claim 5 deposited on a substrate having a temperature between 750°C  
3     and 950°C.

1                   7.     (Original Claim)   The thermal barrier coating according  
2     to Claim 1 formed by a process selected from the group consisting of  
3     chemical vapor deposition, physical vapor deposition, electron beam  
4     evaporation, pulsed electron beam evaporation, laser ablation, and plasma  
5     spraying.

1                   8.     (Original Claim)   The thermal barrier coating according  
2     to Claim 7 using single or multiple sources of materials selected from the  
3     group consisting of rare-earth phosphates and mixtures of rare-earth  
4     precursors with phosphorous precursors.

1                   9.     (Original Claim)   The thermal barrier coating according  
2     to Claim 1 formed with a columnar microstructure.

1                   10.    (Original Claim)   The thermal barrier coating according  
2     to Claim 1 formed with a porous microstructure.

1                   11.    (Original Claim)   The thermal barrier coating according  
2     to Claim 1, wherein the phosphate is lanthanum phosphate.

12-14           (Cancelled)

Page 4 of 10

Patent Application  
Serial No. 10/057,184

1                   15. (Currently Amended)   The thermal barrier coating  
2 according to Claim ~~13~~ 1 further comprising a layer of alumina between the  
3 metallic substrate and said rare-earth element phosphate.

1                   16. (Original Claim)   The thermal barrier coating according  
2 to Claim 15 further comprising a region of rare-earth aluminate between the  
3 alumina and said rare-earth element phosphate.

1                   17. (Currently Amended)   A thermal barrier coating  
2 comprising a layer of ~~The thermal barrier coating according to Claim 1~~  
3 ~~comprising~~ a mixture of lanthanum phosphate, cerium phosphate and  
4 neodymium phosphate rare-earth element phosphate said layer having a  
5 thickness greater than about 20 micrometers, a thermal conductivity less  
6 than about 2 W/mK and disposed on an exterior surface of a substrate so as  
7 to thermally protect the substrate.

1                   18. (Currently Amended)   A thermal barrier coating  
2 comprising a layer of lanthanum phosphate said layer having a thickness  
3 greater than about 20 micrometer and disposed on an exterior surface of a  
4 substrate one of a ceramic substrate and a metallic substrate selected from  
5 the group consisting of a nickel-based superalloy, an iron-based superalloy  
6 and a cobalt-based superalloy so as to thermally protect the substrate, and  
7 further comprising a layer of aluminum phosphate disposed between the  
8 layer of lanthanum phosphate and the metallic substrate.

Page 5 of 10

Patent Application  
Serial No. 10/057,184

1                    19. (Original Claim)    The thermal barrier coating according  
2 to Claim 18 further comprising a monazite crystal structure.

1                    20. (Original Claim)    The thermal barrier coating according  
2 to Claim 18, wherein the ratio between lanthanum and phosphate is about  
3 1:1.

1                    21. (Currently Amended)    The thermal barrier coating  
2 according to Claim 18, wherein the layer has a thickness between about 20  
3 and 500 micrometers.

1                    22. (Original Claim)    The thermal barrier coating according  
2 to Claim 18 deposited on a substrate having a temperature between 600°C  
3 and 1100°C.

1                    23. (Original Claim)    The thermal barrier coating according  
2 to Claim 22 deposited on a substrate having a temperature between 750°C  
3 and 950°C.

Page 6 of 10

Patent Application  
Serial No. 10/057,184

1                   24. (Original Claim) The thermal barrier coating according  
2 to Claim 18 formed by a process selected from the group consisting of  
3 chemical vapor deposition, physical vapor deposition, electron beam  
4 evaporation, pulsed electron beam evaporation, laser ablation, and plasma  
5 spraying.

6                   25. (Original Claim) The thermal barrier coating according  
7 to Claim 24 using single or multiple sources of materials selected from the  
8 group consisting of rare-earth phosphates and mixtures of rare-earth  
9 precursors with phosphorous precursors.

1                   26. (Original Claim) The thermal barrier coating according  
2 to Claim 18 formed with a columnar microstructure.

1                   27. (Original Claim) The thermal barrier coating according  
2 to Claim 18 formed with a porous microstructure.

28.-30. (Cancelled)

1                   31. (Original Claim) The thermal barrier coating according  
2 to Claim 18 further comprising a layer of alumina between the metallic  
3 substrate and the lanthanum phosphate.

1                   32. (Original Claim) The thermal barrier coating according  
2 to Claim 31 further comprising a region of lanthanum aluminate between the  
3 alumina and the lanthanum phosphate.

Page 7 of 10

Patent Application  
Serial No. 10/057,184

1                   33. (Currently Amended)    A thermal barrier coating  
2   comprising a layer of ~~The thermal barrier coating according to Claim 18~~  
3   ~~comprising~~ a mixture of lanthanum phosphate, cerium phosphate and  
4   neodymium phosphate lanthanum phosphate said layer having a thickness  
5   greater than about 20 micrometer and disposed on an exterior surface of a  
6   substrate so as to thermally protect the substrate.

1                   34. (Currently Amended)    A thermal barrier coating  
2   comprising a layer of a mixture of rare-earth element phosphates and  
3   refractory oxides said layer having a thickness greater than about 20  
4   micrometers, a thermal conductivity less than about 2 W/mK and disposed  
5   on an exterior surface of a ~~substrate~~ one of a ceramic substrate and a  
6   metallic substrate selected from the group consisting of a nickel-based  
7   superalloy, an iron-based superalloy and a cobalt-based superalloy so as to  
8   thermally protect the substrate, and further comprising a layer of aluminum  
9   phosphate disposed between the mixture and the metallic substrate.

1                   35. (Previously Presented)   The thermal barrier coating  
2   according to Claim 34, wherein the layer has a thickness between about 20  
3   and 500 micrometers.

1                   36. (Original Claim)    The thermal barrier coating according  
2   to Claim 34 deposited on a substrate having a temperature between 600°C  
3   and 1100°C.

Page 8 of 10

Patent Application  
Serial No. 10/057,184

1                   37. (Original Claim) The thermal barrier coating according  
2 to Claim 34 formed by a process selected from the group consisting of  
3 chemical vapor deposition, physical vapor deposition, electron beam  
4 evaporation, pulsed electron beam evaporation, laser ablation, and plasma  
5 spraying.

6                   38. (Original Claim) The thermal barrier coating according  
7 to Claim 34 formed with a columnar microstructure.

1                   39. (Original Claim) The thermal barrier coating according  
2 to Claim 34 formed with a porous microstructure.

40.-42. (Cancelled)

1                   43. (Currently Amended) A thermal barrier coating  
2 comprising a layer of a mixture of rare-earth element phosphates and  
3 refractory oxides said layer having a thickness greater than about 20  
4 micrometers, a thermal conductivity less than about 2 W/mK and disposed  
5 on an exterior surface of a substrate so as to thermally protect the substrate  
6 ~~The thermal barrier coating according to Claim 34~~ further comprising a layer  
7 of alumina between the ~~metallie~~ substrate and the mixture.

1                   44. (New) The thermal barrier coating according to Claim 43  
2 further comprising a region of rare-earth aluminate between the alumina and  
3 said rare-earth element phosphates.